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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/591,066	06/27/2007	Atsushi Asada	14434.115USWO	5959
52835 7590 07/21/2008 HAMRE, SCHUMANN, MUELLER & LARSON, P.C. P.O. BOX 2902 MINNEAPOLIS, MN 55402-0902				
EXAMINER				
SUTTE, DRYANT P				
ART UNIT		PAPER NUMBER		
1795				
MAIL DATE		DELIVERY MODE		
07/21/2008		PAPER		

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

# Office Action Summary

## Application No.

10/591,066

## Applicant(s)

ASADA ET AL.

## Examiner

BRYANT SUITTE

## Art Unit

1795

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☐ Responsive to communication(s) filed on \_\_\_\_.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 1-13 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-13 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 30 August 2006 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

## Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

## Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO/SE/08)
- Paper No(s)/Mail Date 8/30/06, 11/29/06, 12/26/07
- 4) ☐ Interview Summary (PTO-413)
- Paper No(s)/Mail Date \_\_\_\_
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: \_\_\_\_

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**REINFORCING MATERIAL FOR PROTON CONDUCTIVE MEMBRANE, AND  
PROTON CONDUCTIVE MEMBRANE USING THE SAME AND FUEL CELL**

Examiner: Suitte

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July 8, 2008

***Claim Rejections - 35 USC § 103***

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 1, 7, 8, 10, 11, 12 and 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nomura et al. (US 2004/0062970) in view of Ino et al. (US 2006/0068270).

Regarding claims 1, 12, and 13, Nomura discloses a proton-conducting membrane comprising a three-dimensional silicon-oxygen structure. It is resistant to heat, swells and contracts to a limited extent with changed humidity. The reinforcing agent can be fibrous, fibril or porous membrane form (I). The reinforcing agent can comprise fluorine resin represented by polytetrafluoroethylene, cyclic polyolefin resin, high-molecular-weight polyolefin and inorganic materials, e.g., glass as the materials resistant to these severe environments. See paragraph 177 and 178. The fibrous materials can comprise a diameter of 3 to 20  $\mu\text{m}$  and a length of 1 mm to 10 mm long. See paragraph 191-199. Nomura discloses the utilization of E-glass but not C-glass as the glass fibrous material.

Ino discloses that C-glass and E-glass can be utilized as fibrous materials in the production of a non-woven fabric material. See paragraph 24. Therefore, it would have been obvious to one of ordinary skill in the art to utilize C-glass in the production of the non-woven fabric material in the proton conducting membrane of Nomura because Ino discloses that C-glass operates under high temperature and is resistant to acid. See paragraph 24.

Regarding claim 2, Nomura discloses The present invention also provides a method for producing the proton-conducting membrane, comprising steps of preparing a mixture containing an organic/inorganic hybrid (binder), cross-linkable compound (C) and compound (D), the former having 2 or more cross-linkable silyl groups and carbon atoms each being bonded to the silyl group via the covalent bond and the latter having a cross-linkable silyl group and acid group. See abstract.

Regarding claim 7, Nomura discloses the weave density is 10 to 50 g/m<sup>2</sup>. See paragraph 209.

Regarding claim 8, Nomura discloses the thickness of the square weave is essentially determined by the above specifications, 20 to 100  $\mu\text{m}$ . See paragraph 208.

Regarding claim 10, Nomura discloses a silanol group (coupling agent) that reacts with the organic/inorganic hybrid structure (binder) (A) and acid-containing structure (B). See paragraph 180.

Regarding claim 11, Nomura discloses a quantity of the solution loaded on to the membrane was set at 50 g/m.sup.2. See paragraph 436.

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3. Claims 3, 4, 5, 6, and 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nomura et al. (US 2004/0062970) and Ino et al. (US 2006/0068270) as applied to claims 1, 2, 7, 8, 12 and 13 above, and in further view of Fongalland et al. (WO 00/24075).

Regarding claims 3, 4, and 5, Nomura discloses a proton-conducting membrane comprising a three-dimensional silicon-oxygen structure as recited in the above paragraph. However, Nomura does not disclose a weight percent of an inorganic binder.

Fongalland discloses a binder, i.e. colloidal silica, for use in preparing the substrate in the form of a dilute aqueous dispersion, in 1-30 weight percent, preferably 10 weight percent in aqueous solution. See column 4 lines 5-30. Therefore, it would have been obvious to utilize the binder in the formation of the proton conducting membrane of Nomura because Fongalland teaches the binder is applied during the process for forming the matrix of fibers.

Regarding claim 6, Nomura discloses a proton-conducting membrane comprising a three-dimensional silicon-oxygen structure as recited in the above paragraph. However, Nomura does not disclose a weight percent of a fibrous binder to the glass fibers.

Fongalland discloses the binders are mixed before application. The binder can comprise colloidal silica:PTFE (fibrous binder) mixed binder. The ratio of silica to polymer may be in the range of from 95:5% to 5: 95%, and is preferably in the range of 90:10% to 10:90%, such as 70:30% to 30:70%, e.g. 50:50%. The mixed binder for use

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in the substrate is in the form of a dilute aqueous dispersion, such as a 1-30 weight percent, preferably a 5-20 weight percent e.g. about 10 wt % solids in the aqueous solution. See column 4 lines 9-21. It can be concluded that the fibrous binder are composed within the 1-30 weight percent thereby the fibrous binder can be 1-30 weight percent of the glass fibers composition. Therefore it would have been obvious to one of ordinary skill in the art to utilize the mixed binder comprising the fibrous binder with the chemical composition of the proton conducting membrane of Nomura because Fongalland teaches applied during the process for forming the matrix of fibers.

Regarding claim 9, Nomura discloses a proton-conducting membrane comprising a three-dimensional silicon-oxygen structure as recited in the above paragraph. However, Nomura does not disclose a weight percent of a porosity of the non-woven fabric.

Fongalland teaches a porous substrate can have 50 or at least 75% comprising individual pore sizes being greater than 1  $\mu\text{m}$  in at least one direction. See column 5 lines 10-12. Therefore it would have been obvious to one of ordinary skill in the art to utilize the porous substrate with the proton conducting membrane of Nomura because Fongalland teaches the substrate comprising the porosity is suitable for use in the preparation of a composite membrane for use in a fuel cell. See column 5 lines 13-15.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to BRYANT SUITTE whose telephone number is (571)270-3961. The examiner can normally be reached on Mon-Fri 10-6.

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Dah-Wei Yuan can be reached on 571-272-1295. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

BS

/Dah-Wei D. Yuan/  
Supervisory Patent Examiner, Art Unit 1795

